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IS : 9744 - 1981

Indian Standard

CODE OF SAFETY FOR THIONYL CHLORIDE

UDC 614·878 : 546·223·1·13

भारतीय मानक ब्यूरो
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AMENDMENT NO. 1 DECEMBER 1981

TO

IS:9744-1981 CODE OF SAFETY FOR THIONYL CHLORIDE

Corrigenda

(*Page 1, Committee Composition, first column, line 2 from bottom*) – Substitute 'DR K. NARAYANAN RAO' *for* 'DR K. NARAYANA RAO'.

(*Page 4, clause 3.1, informal table, second column*):

a) *Against* (b) – Substitute '$SOCl_2$' *for* 'SOC12'.

b) *Against* (f) – Delete the matter '78.8 at 746 mm'.

(*Page 6, clause 6.1, line 1*) – Substitute 'in' *for* 'as'.

(CDC 18)

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(*Continued from page 2*)

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AMENDMENT NO. 2 DECEMBER 2006
TO
IS 9744 : 1981 CODE OF SAFETY FOR THIONYL CHLORIDE

[*Page* 4, *clause* **3.1**(r)] — Insert the following at the end:

'Thionyl Chloride is very reactive with water, ammonia, chloryl perchlorate, dimethyl sulphoxide, linseed oil, quinoline, sodium, 2,4-hexadiyn-1-6-diol, *o*-nitrobenzoyl acetic acid, and *o*-nitro phenyl acetic acid.'

[*Page* 4, *clause* **3.1**(s)] — Substitute the following for the existing:

'Threshold limit value (TLV-C): 1 ppm'.

(*Page* 4, *footnote marked* *) — Delete

(CHD 8)

Reprography Unit, BIS, New Delhi, India

Indian Standard

CODE OF SAFETY FOR THIONYL CHLORIDE

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(*Continued on page* 2)

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(*Continued on page* 8)

Indian Standard

CODE OF SAFETY FOR THIONYL CHLORIDE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 13 February 1981, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

0.2 Thionyl chloride, also known as sulphurous oxychloride is a pale yellow to red liquid with a sharp odour. Thionyl chloride is used as a catalyst and chlorinating agent in chemical industry; it is also used in organic synthesis, pesticides, engineering and plastic industries.

0.3 Thionyl chloride is very toxic, and in the presence of moisture it yields toxic decomposition products, namely, hydrogen chloride and sulphur dioxide. Though no hygienic standard of permissible exposure has been published, a twenty minute exposure to 17·5 ppm has been found in experiments on cats to be fatal.

0.4 In the preparation of this code, assistance has been derived from the following publication:

> SAX (NI). Dangerous Properties of Industrial Chemicals. 1975. Fourth Edition. Van Nostrand Reinhold Co, New York.

1. SCOPE

1.1 This standard describes important properties of thionyl chloride, the nature of hazards associated with it, and essential information and directions on storage, handling, marking, labelling, preventive measures, environmental monitoring and first-aid.

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in IS : 4155-1966* and IS : 4167-1981† shall apply.

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*Glossary of terms relating to chemical and radiation hazards and hazardous chemicals.

†Glossary of terms relating to air pollution (*first revision*).

(SALES)

3. PROPERTIES OF THIONYL CHLORIDE

3.1 The important properties of thionyl chloride are as follows:

a) *Chemical Name* : Thionyl chloride; sulphur oxychloride; sulphurous oxychloride

b) *Chemical Formula* : $\mathrm{SOCl2}$

c) *Molecular Weight* : 118·97

d) *Description* : Fuming liquid, colourless to pale yellow or yellow to red, clear liquid

e) *Odour* : Characteristic pungent odour similar to that of sulphur dioxide; vapour irritates respiratory system, eyes and skin

f) *Boiling Point*, °C : 78·8 at 746 mm
  - i) Technical grade 77
  - ii) 100% pure material 78·8 at 746 mmHg

g) *Freezing Point*, °C : −105

h) *Vapour Density* : 4·1 (air = 1)

j) *Vapour Pressure at 27°C* : 110 mmHg

k) *Relative Density* 15·5°C/15·5°C : 1·640

m) *Viscosity* at 0°C : 0·01 cp
   30°C 0·545 cp

n) *Percentage in 'Saturated' Air at 27°C* : 14·5

p) *Density of Saturated Air at 27°C* : 1·5 (air = 1)

q) *Solubility* : Miscible with benzene, chloroform and carbon tetrachloride in all proportions

r) *Chemical Reactivity* : Reacts violently with water and fumes in moist air. Hydrolyzed by water into sulphur dioxide and hydrochloric acid. Decomposes into chlorine, sulphur dioxide and sulphur monochloride when heated above 140°C

s) *Threshold Limit Value* (TLV) : 5 ppm*

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*This is based on 'Toxic and Hazardous Industrial Chemicals Safety Manual', issued by the International Technical Information Institute, Tokyo, Japan.

4. HAZARDS ASSOCIATED WITH THIONYL CHLORIDE

4.1 Health Hazards and Toxicity

4.1.1 Thionyl chloride vapour irritates respiratory system, eyes and skin. The liquid is highly corrosive and causes burns on the skin, eyes and mucous membranes, whenever it comes in contact with these parts. Its ingestion results in severe internal irritation and damage. However, no permanent ill effect is reported.

4.1.2 *Symptoms* — Conjunctivitis, dermatitis, rhinitis (inflammation of nose) and pneumonia.

5. STORAGE AND HANDLING

5.1 Storage — Depending on the quantity, thionyl chloride may be stored in bottles made of glass which should be provided with inner cushioning and absorbent material when packed together in wooden boxes In the case of bulk quantities, it may be stored in glass carboys covered by closely fitting wicker or bamboo work, packed individually in a wooden slatted crate iron hamper. It may also be stored in suitable heavy duty galvanized drums provided the bungs are tightly closed. Handling in this case is less hazardous than when stored in glass carboys.

5.1.1 The packed material shall be stored in cool, dry and sufficiently ventilated rooms.

5.1.2 The material shall be stored away from water.

5.2 The containers shall be carefully handled while loading, transporting or unloading, as damaged containers may leak and cause dangerous concentrations of its vapour in an enclosed space.

5.2.1 Unreacted thionyl chloride escaping from the reaction vessel shall be properly scrubbed with caustic soda solution or soda ash.

5.3 In case of fire fighting, water shall not be used. Only dry powder or carbon dioxide fire extinguisher should be used.

6. MARKING AND LABELLING

6.1 All containers of thionyl chloride shall bear an identifying label as depicted in IS : 1260 (Part I)-1973*. (Thionyl chloride has been classified as corrosive as IS : 1446-1959*.) The containers shall in addition be labelled as follows:

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*Pictorial markings for handling and labelling of goods: Part I Dangerous goods.

THIONYL CHLORIDE

WARNING : CAUSES BURNS, VAPOUR IRRITATING
KEEP THE CONTAINER CLOSED IN A COOL PLACE
AVOID CONTACT WITH EYES, SKIN AND CLOTHING
DO NOT ALLOW WATER TO GO INTO CONTAINER
REACTS VIOLENTLY WITH WATER
USE WITH ADEQUATE VENTILATION

6.2 Containers of waste or other materials contaminated with thionyl chloride should be labelled as follows:

THIONYL CHLORIDE CONTAMINATED MATERIAL
DISPOSE OFF OR DECONTAMINATE USING
APPROVED PROCEDURE

7. PREVENTIVE MEASURES

7.1 Areas where thionyl chloride is handled should be well ventilated. A high standard of maintenance in the whole plant should be provided to facilitate compliance with hygienic conditions.

7.1.1 Adequate protective safety equipment in the form of PVC gloves, PVC aprons, goggles, face shield canister gas mask (preferably, compressed air mask), etc, should be worn when handling thionyl chloride.

7.1.2 Before opening a container, complete protective clothing, goggles and effective respirator or positive air supply hood shall be worn. Clean, preferably white, PVC gloves shall be used as rubber absorbs thionyl chloride after prolonged use.

7.2 Monitoring

7.2.1 Potential areas of leakage shall be checked on regular basis. Environmental monitoring should be carried out at different work places regularly to detect thionyl chloride concentration. Complete and accurate records of all environmental measurements should be maintained.

7.2.2 *Determination in the Atmosphere* — Concentrations of thionyl chloride vapour in the air shall be determined by drawing contaminated air through two scrubbers containing a measured quantity of 0·1 N silver nitrate solution acidified with nitric acid. When sampling has been completed, 0·1 N sodium chloride solution equivalent to the silver nitrate used shall be added and the excess chloride back titrated with 0·1 N silver nitrate.

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*Classification of dangerous goods.

8. SPILLS AND WASTE DISPOSAL

8.1 In case of spills and leakage the affected area shall be covered with sodium bicarbonate or an equal mixture of soda ash and slaked lime. After thorough mixing, water shall be sprayed from an atomizer with adequate precautions. This mixture should then be transferred slowly to a large container of water. It is then neutralized and drained into the sewer with sufficient water.

8.2 Solid waste material containing significant level of residual thionyl chloride should be transferred from the plant to special containers located in designated areas within the works boundary where it shall be suitably treated.

9. FIRST AID

9.1 Inhalation — In case of inhalation of thionyl chloride, the affected person should be removed to a clean environment and allow to rest, keeping him warm. In severe cases oxygen should be administered using intermittent positive pressure breathing apparatus, and also immediate medical attention should be obtained.

9.2 Contact with Eyes and Skin — If thionyl chloride has got into the eyes wash them with plenty of water. Remove soaked clothing and wash affected skin with soap and water. Wash contaminated clothing with water before reusing. In case of serious burns call for medical attention immediately.

9.3 Ingestion — Wash out the mouth thoroughly with water and give plenty of water to drink, followed by milk of magnesia or 5 percent solution of sodium bicarbonate may be used as well as bronchodilators and decogestants. Obtain medical attention.

(*Continued from page 2*)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	$1\ \mathrm{N} = 1\ \mathrm{kg.m/s^2}$
Energy	joule	J	$1\ \mathrm{J} = 1\ \mathrm{N.m}$
Power	watt	W	$1\ \mathrm{W} = 1\ \mathrm{J/s}$
Flux	weber	Wb	$1\ \mathrm{Wb} = 1\ \mathrm{V.s}$
Flux density	tesla	T	$1\ \mathrm{T} = 1\ \mathrm{Wb/m^2}$
Frequency	hertz	Hz	$1\ \mathrm{Hz} = 1\ \mathrm{c/s}\ (\mathrm{s^{-1}})$
Electric conductance	siemens	S	$1\ \mathrm{S} = 1\ \mathrm{A/V}$
Electromotive force	volt	V	$1\ \mathrm{V} = 1\ \mathrm{W/A}$
Pressure, stress	pascal	Pa	$1\ \mathrm{Pa} = 1\ \mathrm{N/m^2}$

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